

U.S. EPA Landfill Methane Outreach Program Landfill Gas Analysis Report for Hickory Hill Landfill

A landfill gas generation curve was developed for the Hickory Hill Landfill in Ridgeland, SC, using several parameters specific to the landfill and defaults from AP-42¹. These data were entered into the EPA LandGEM² software to estimate landfill gas production, beginning with the year after the landfill opened. The values of these model input parameters are provided in Table 1. Landfill-specific data were obtained from emails³, which are included in Appendix A. These data include the year the landfill opened, the current amount of waste-in-place, the current annual waste acceptance rate, the remaining landfill capacity, and the expected year of closure. The current waste-in-place amount was used to calculate an average annual waste acceptance rate from the year the landfill opened until 2000. The average annual waste acceptance rate from 2002 until the landfill closes was calculated by the LandGEM software using the waste capacity and closure year of the landfill.

It is important to note that, as shown in Table 1, the calculated average annual waste acceptance rate for the landfill open year until 2000 is significantly higher than the current acceptance rate provided. This may result in an underestimate or overestimate of the actual landfill gas production over time. In future analyses, it would be useful to obtain actual annual acceptance rates for years prior to the current year, and to verify planned future acceptance rates in relation to the total design capacity and closure year, to ensure the accuracy of the landfill gas production results.

Collection of the landfill gas at its peak flowrate of 925 mmcf in 2025 would be equivalent to any of the following environmental benefits:

Removing 41,000 cars from the road
Planting 55,000 acres of forest
Offsetting the use of 920 railroad cars of coal
Preventing the use of 437,000 barrels of oil

Also necessary for the model to run are the following parameters: L_0 (methane generation potential), k (methane generation rate constant), and the percent volume of methane and carbon dioxide in the landfill gas. Defaults from AP-42 were used for L_0 and k , and LandGEM software defaults were used for the percent methane and carbon dioxide. The AP-42 default value for k for non-arid areas was used because several sources indicated an average annual precipitation of greater than 25 inches for the area surrounding the landfill.

Table 1: Model Input Parameters for the Hickory Hill Landfill

Model Parameter	Value	Units
Year Landfill Opened	1997	----
Expected Landfill Closure Year	2025	----
Waste Capacity	7,606,789	tons
Waste-In-Place	2,867,263	tons
1997-2000 Annual Waste Acceptance Rate ^a	716,816	tons/yr
2001 Annual Waste Acceptance Rate ^b	307,000	tons/yr
2002-2025 Annual Waste Acceptance Rate ^c	184,657	tons/yr
Methane Generation Rate Constant (k)	0.04	1/yr
Methane Generation Potential (L _o)	3,203	ft ³ /ton
Percent Methane in Landfill Gas	50	%
Percent Carbon Dioxide in Landfill Gas	50	%

^a Calculated based on 2,867,263 tons of waste-in-place over the four-year period of 1997 to 2000, as provided in Reference 3.

^b Provided in Reference 3 for 2001.

^c Based on remaining waste capacity and a closure year of 2025, as provided in Reference 3.

The estimated waste-in-place in tons and landfill gas generation in million cubic feet per year (mmcf/yr) for a 50-year period are shown in Table 2. Also provided is the estimated amount of landfill gas recovered over time, which was calculated using the assumption of an 85% collection rate. The graph was created using the landfill gas production and recovery data in Table 2. The curves demonstrate the landfill gas generation and recovery rates over time and the straight, vertical line indicates the current year.

These projections have been prepared specifically for the Hickory Hill Landfill on behalf of the U.S. EPA Landfill Methane Outreach Program (LMOP), and are based on engineering judgement and represent the standard of care that would be exercised by a professional reasonably experienced in the field of landfill gas projections. ERG and LMOP do not guarantee the quantity of available landfill gas, and no other warranty is expressed or implied. No other party is intended as a beneficiary of this work product, its content, or information embedded therein. Third parties use this information at their own risk. ERG and LMOP assume no responsibility for the accuracy of information obtained from, compiled, or provided by other parties.

References

1. Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume 1: Stationary Point and Area Sources. Chapter 2: Solid Waste Disposal. Section 2.4.4.1. U.S. EPA. November 1998. <http://www.epa.gov/ttn/chief/ap42/ch02/final/c02s04.pdf>
2. Landfill Gas Emissions Model, version 2.01. U.S. EPA. January 6, 1999. <http://www.epa.gov/ttn/catc/products.html>
3. Email correspondence from Sonny DuBose, South Carolina Office of Energy, to Shelley Cohen, LMOP. October 23 and 30, 2001. Shown in Appendix A.

Appendix A

E-mails Containing Data for the Hickory Hill Landfill

-----Original Message-----

From: Sonny Dubose [mailto:SDubose@ogs.state.sc.us]

Sent: Tuesday, October 23, 2001 7:24 AM

To: Shelley Cohen

Subject: Landfill Info for Gas Curves

Shelley:

I'm not all the way there yet, but, here's some of the information:

MSW Landfill	Year Opened	Amt of in place waste (tons)	Tons/Year Waste Acceptance	Cubic Yards Remaining Capacity	Year of closure
Bee's Ferry	12/9/77	2,260,454	136,000	1,430,000	2006
Oak Ridge	12/22/83	7,821,360	1,144,000	10,813,277	2011
York Cnty	5/13/80	2,955,847			1998
Hickory Hill	6/26/97	9,000,000	307,000	7,900,000	2025
Lee Cnty	5/23/94	3,674,775	1,277,000	19,231,100	2012

As soon as I pull together the rest, I'll get that information to you.

THANKS!!

Sonny

-----Original Message-----

From: Sonny Dubose [mailto:SDubose@ogs.state.sc.us]

Sent: Tuesday, October 30, 2001 2:17 PM

To: Cohen.Shelley@epamail.epa.gov; jkfranklin@theitgroup.com

Subject: CORRECTIONS!

PLEASE FORGIVE ME FOR THE MISINFORMATION ON OAKRIDGE & HICKORY HILL
LANDFILLS.

The correct WASTE IN PLACE:

OAKRIDGE: 3,183,595 tons;

HICKORY HILL: 2,867,263 tons.

The other numbers should be okay, as they're provided by DHEC.

Thanks!

Sonny